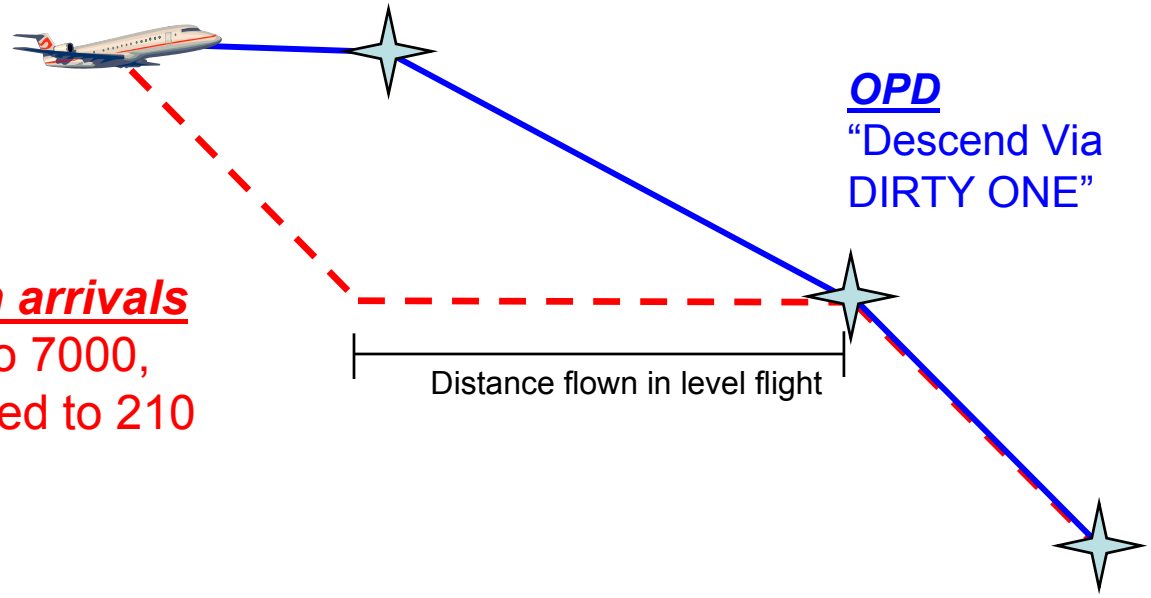
Optimized Profile Descent (OPD)

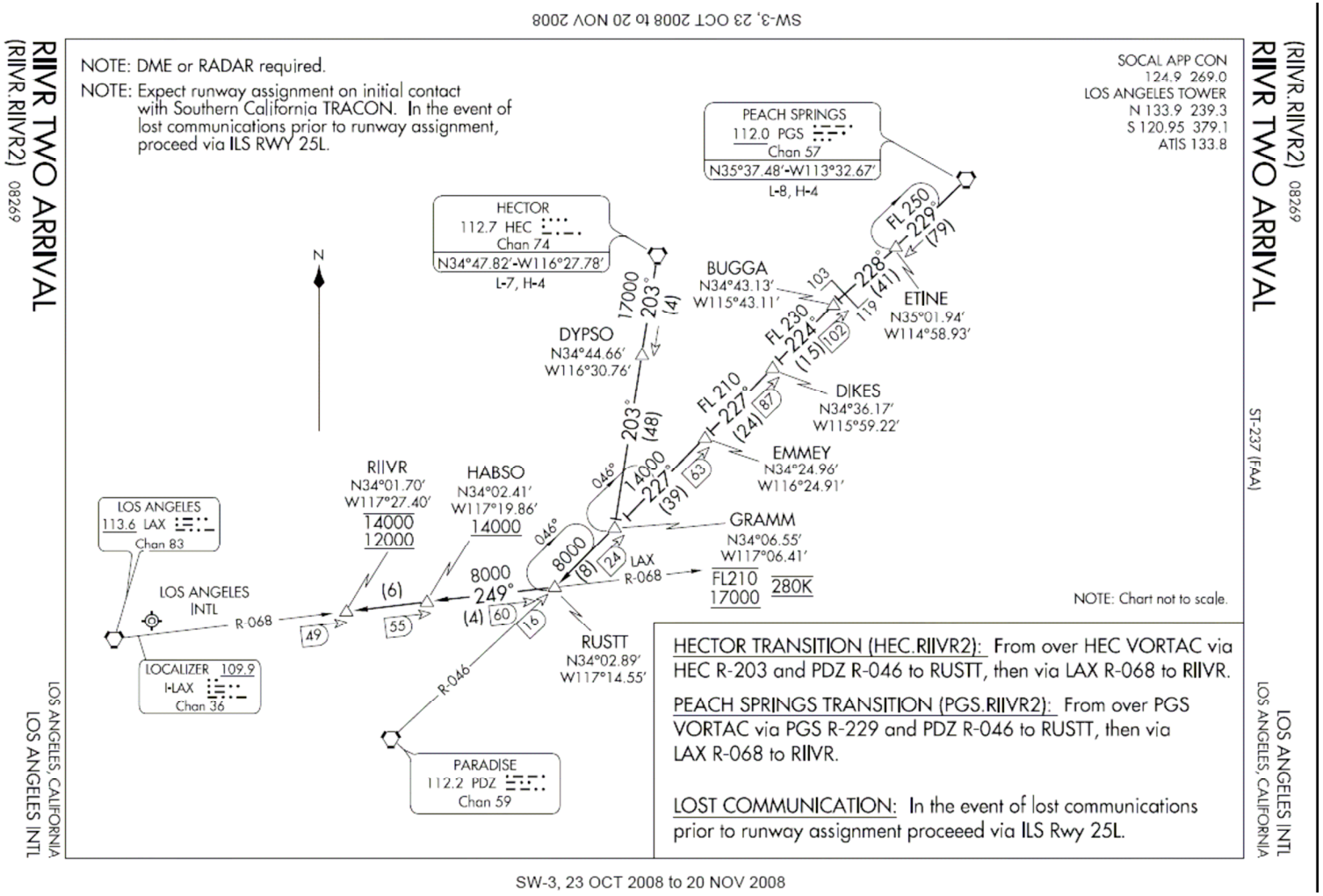
Lead: Jim Arrighi

Optimized Profile Descent (OPD) - What Is It?

- **Published procedure**
  - Possibility of vertical and/or speed constraints
- **Provide a more optimized descent profile**
  - Increased opportunity for reduced-power descent
  - Time, Fuel, Emissions Benefits

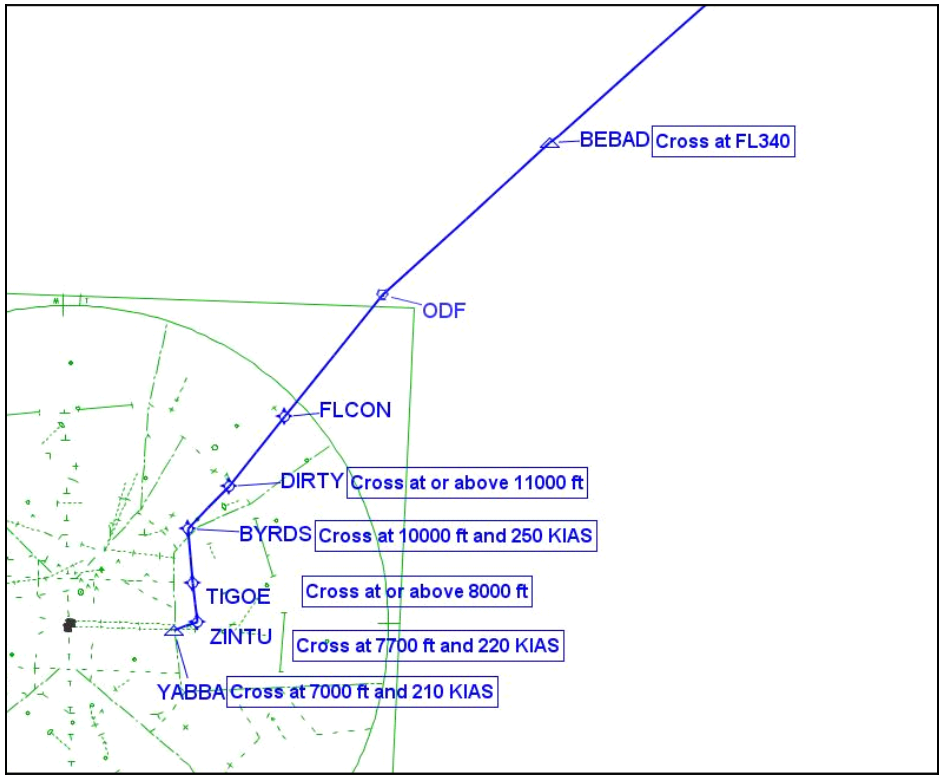


Conventional Procedure - RIIVR TWO Arrival at LAX

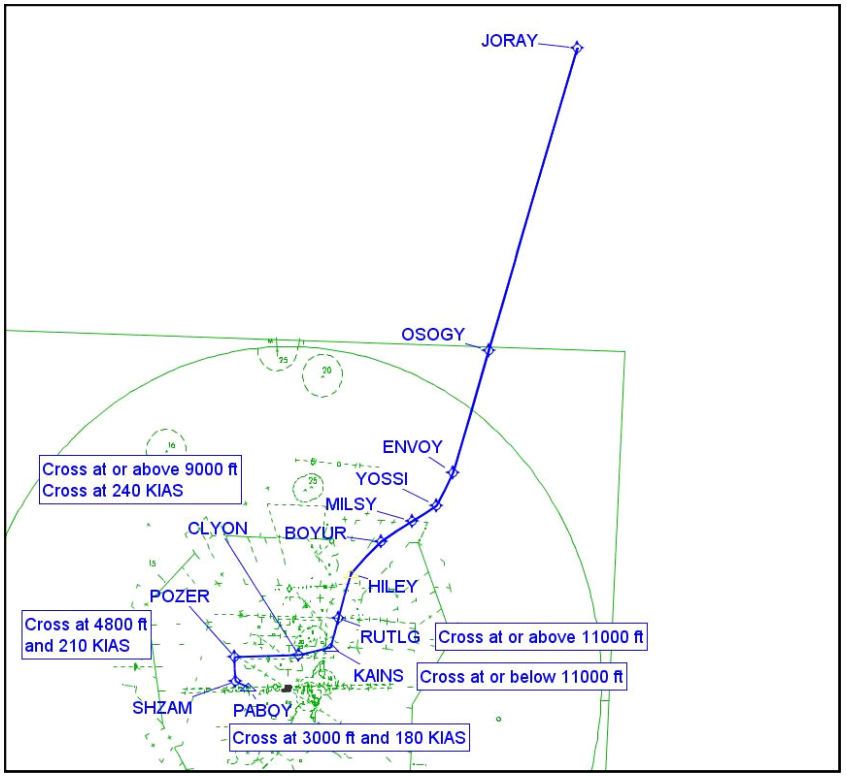


RNAV Procedures – DIRTY RNAV Arrival at ATL, RUTLG RNAV Arrival at MIA

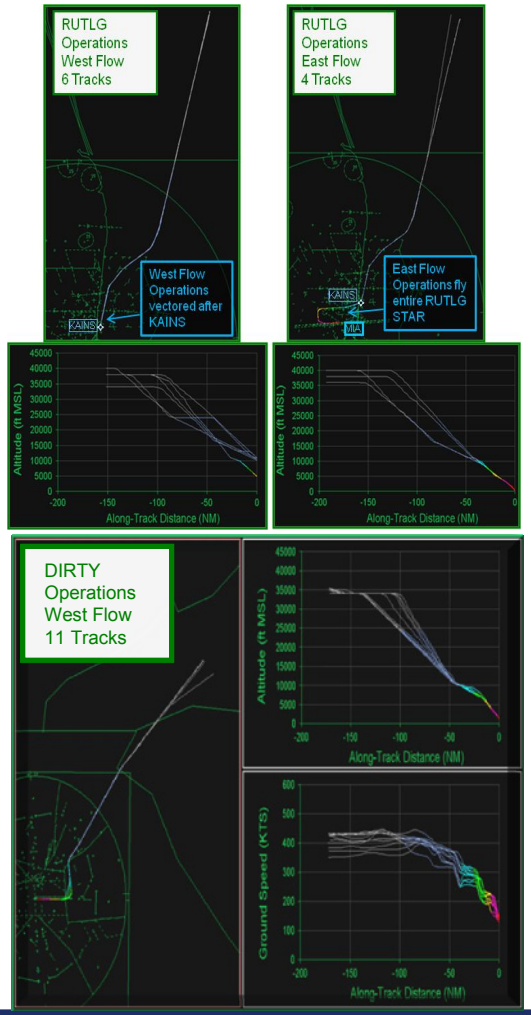
DIRTY RNAV Arrival



RUTLG RNAV Arrival

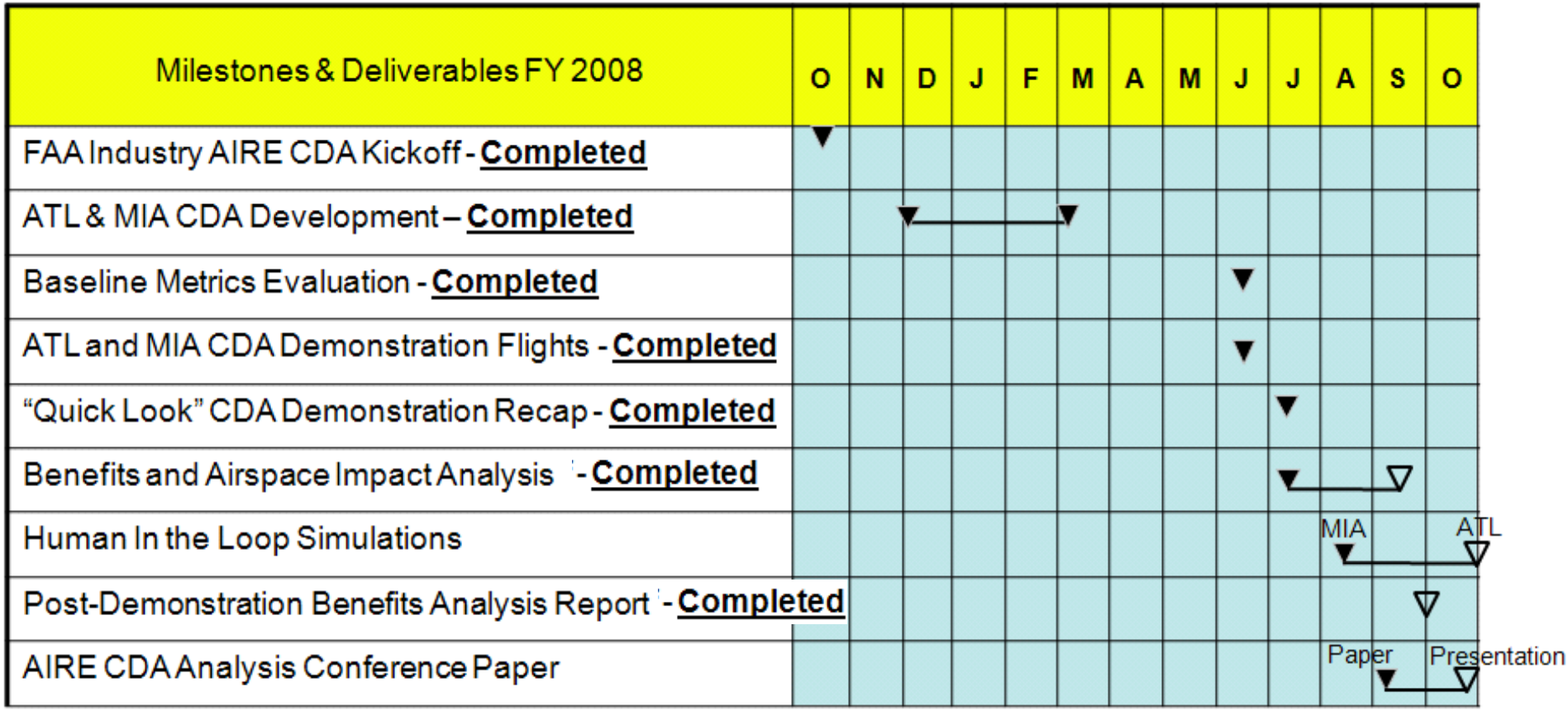


Demonstrations and Analysis of Optimized Profile Descent (OPD) Procedures



- **Atlantic Interoperability Initiative to Reduce Emissions (AIRE) – Signed June 07**
- **Administrator's Goal: "Complete demos at ATL and MIA by May 08"**
- **FAA/Industry teams formed for ATL and MIA**
  - Kickoff meeting occurred in Sept. 07
  - 20+ demo flights flown at ATL and MIA in May 08
  - Savings: Fuel (48-52 gals/flt), CO2 (460-497 kg)
    - Driven by improved vertical profiles
- **ATL plans for on going East flow demos for regular operational usage (HITLS 10/27)**
- **MIA plans include Oceanic tie via Tailored Arrivals**
- **Hank Krakowski (FAA - Chief Operating Officer) and Joe McCarthy (FAA - Mgr. RNAV and RNP Group) briefed Mr. Sturgell in July, he said accelerate!**
- **FY09 – FAA/CAASD analysis for industry coordination on site prioritization due in February of 2009**

AIRE - OPD Milestones and Deliverables

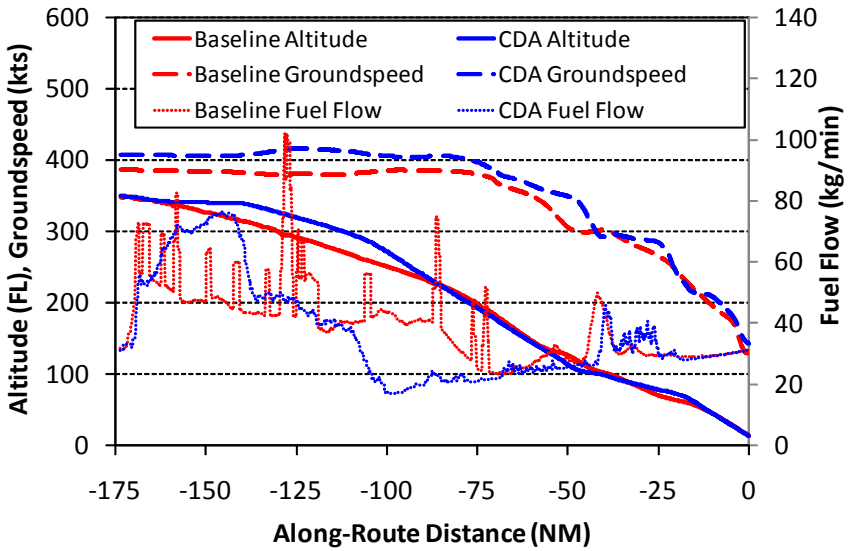


FY08 OPD Activities

- **AIRE OPD Coordination**
  - Two OPD procedures were developed at ATL and MIA
  - 21 OPD demonstration flights were conducted
- **Technical Analysis**
  - AIRE CDA/OPD Demonstration Recap
  - Benefit Analysis of AIRE CDA Demonstration Flights
  - AIRE CDA Human-In-The-Loop (HITL) Simulations
  - AIRE CDA Airspace and Airport Impacts

Atlanta OPD Benefits Analysis Results

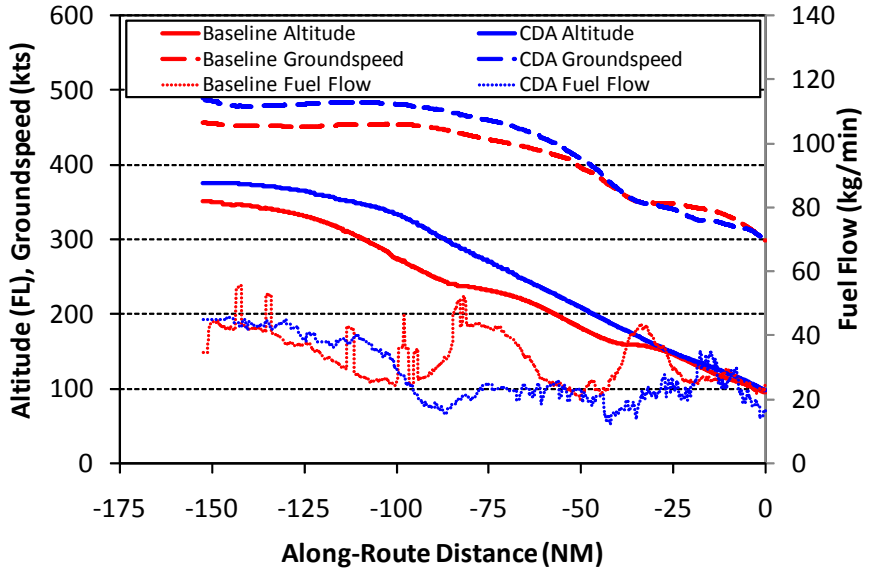
Metric	Baseline Average Per Flight	Average OPD Difference from Baseline
Fuel Burn (gal)	393	-38 (-10%)
CO_2 emissions (kg)	3780	-360 (-10%)
Time Flown (min)	31.5	- 0.8 (-3%)



- **Estimated fuel burn reductions of 38 gallons per flight**
- **Estimated CO_2 emissions reductions of 360 kilograms per flight**
- **Observed time savings of 0.8 minutes per flight**
  - Consistent with higher average groundspeeds for CDA flights

Miami OPD Benefits Analysis Results – West Flow

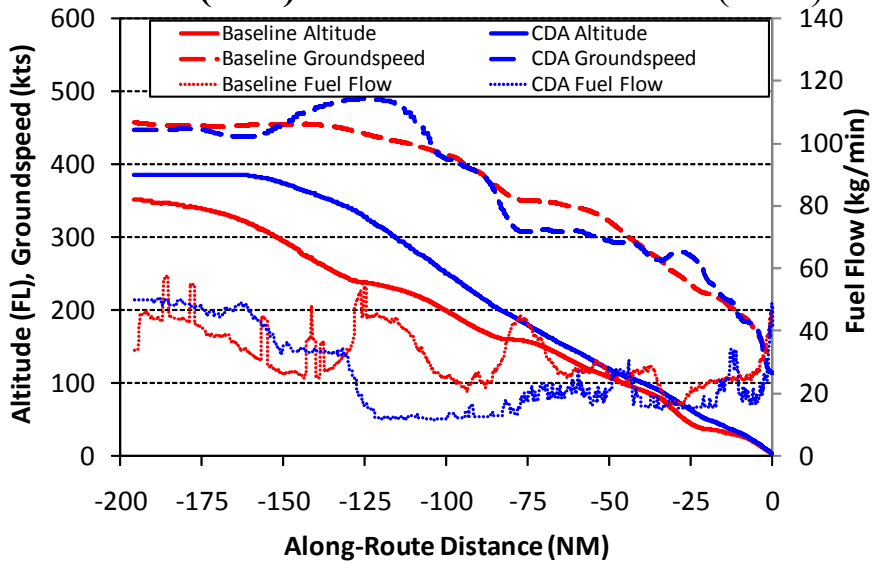
Metric	Baseline Average per Flight	Average OPD Difference from Baseline per Flight
Fuel Burn (gal)	233	- 48 (-21%)
CO_2 emissions (kg)	2241	- 460 (-21%)
Time Flown (min)	22.7	- 0.75 (-3%)



- Estimated fuel burn reduction of 48 gallons per flight
- Estimated CO_2 emissions reductions of 460 kilograms per flight
- Fuel efficiency gains are most noticeable where baseline flights level off at FL240 and 16000 ft MSL

Miami OPD Benefits Analysis Results - East Flow

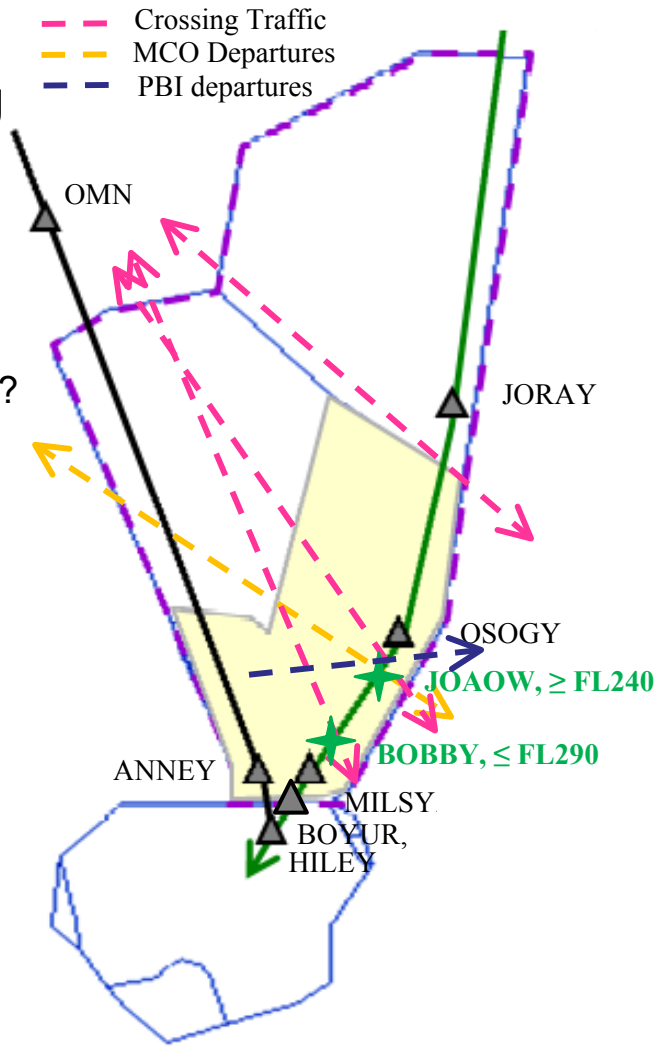
Metric	Baseline Average	Average CDA Difference from Baseline
Fuel Burn (gal)	324	- 52 (-16%)
CO_2 emissions (kg)	3121	-497 (-16%)
Time Flown (min)	31.6	+ 2.4 (+8%)



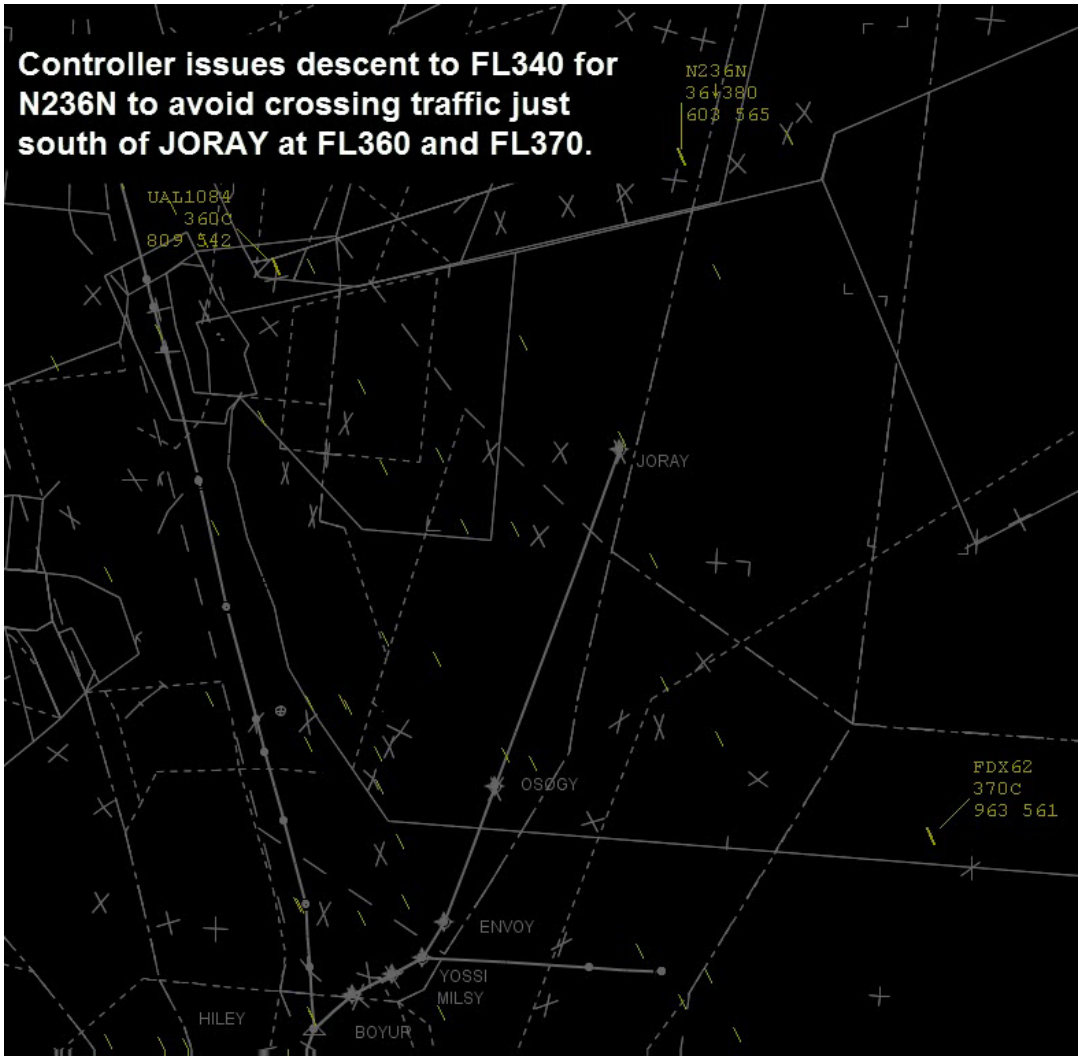
- **Estimated fuel burn reduction of 52 gallons per flight**
- **Estimated CO_2 emissions reductions of 497 kilograms per flight**
- **Observed flight time increase of 2.4 min/flight**
  - Consistent with increased route distance on the RUTLG in the terminal area
- **Fuel efficiency gains are most noticeable where baseline flights level off at FL240 and 16000 ft MSL**

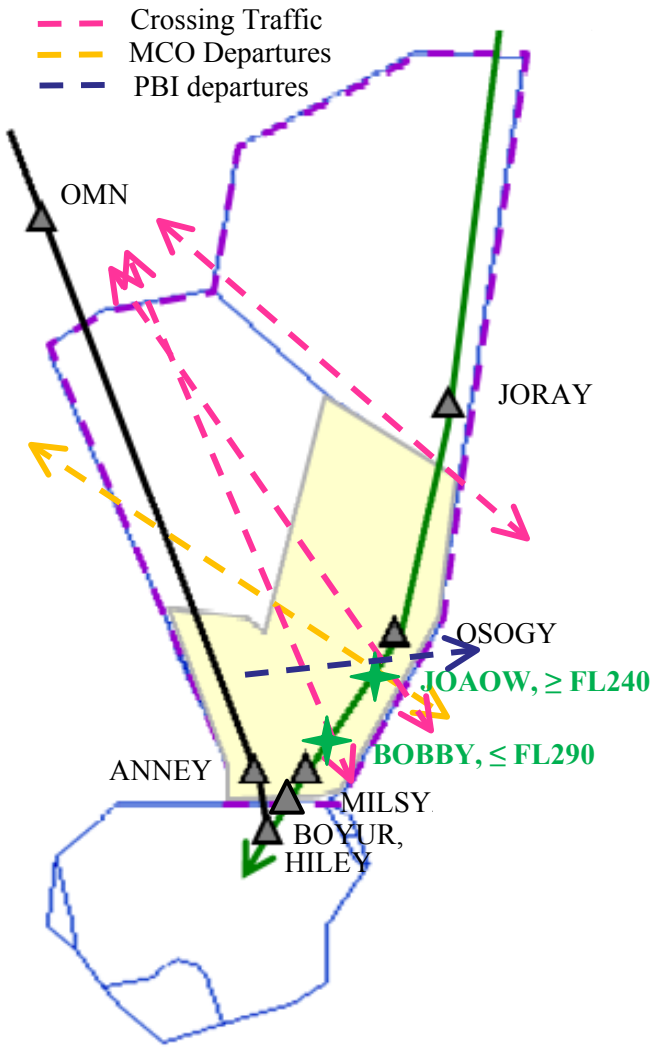
Human In the Loop Simulations

- **Objective: Identify issues and possible mitigation strategies associated with conducting CDA during peak traffic operations**
- Identify factors involved in deciding which aircraft could be cleared to the CDA
- Investigate impact of CDA on surrounding traffic
  - Under what circumstances must the CDA be discontinued?
  - Identify methods for mitigating these impacts
- Increase understanding of necessary inter-facility communications
- **Operational impacts of CDA identified through HITLs**
- Crossing traffic
- Merging traffic
- Sector point-outs
- Inter-facility coordination



Human In the Loop Simulations





FY 09 and 10 OPD Plans

- **OPD Prioritization Analysis February 09**
  - Coordination with EWG, industry, and FAA lines of business (e.g. AVN, AFS, etc.)
  - Site specific analysis, procedures design, and implementations
- **Integrated Oceanic/Arrival Demo April 09**
- **Working with AIRE for Integrated Arrival Surface Demo - March 10**
- **Working with AIRE for Gate-to-Gate Demo Sept. 10**
- **CHS OPD Demos September 09 (DoD)**
- **ATL OPD HITL**
- **Procedure Design Activity**

Conclusions

- **OPD/CDA benefits demonstrated through AIRE demos at ATL and MIA**
  - ATL: Estimated fuel burn reductions of approximately 38 gallons per flight, CO_2 reductions of approximately 360 kg per flight
  - MIA: Estimated fuel burn reductions of approximately 48-52 gallons per flight, CO_2 reductions of approximately 460-500 kg per flight
- **Operational CDA impacts identified through HITLs at ATL and MIA**
  - Crossing traffic
  - Departure traffic
  - Sector point-outs
  - Inter-facility coordination
- **Airspace and airport impacts of CDA**
  - Sector geometries
  - Traffic flows in sector
  - CDA top-of-descent location